NEUROSCIENCE AT WIKO
KEIR PEARSON

Keir Pearson is a neurophysiologist who received his Bachelor of Engineering (Electrical) from the University of Tasmania in 1964. He was awarded a Rhodes Scholarship in 1964 and earned his Ph.D. in Physiology in 1968 from Oxford University. He spent two years as a Junior Research Fellow at Merton College, Oxford, before joining the Physiology Department at the University of Alberta. He is currently a Professor of Physiology and the Director of the Centre for Neuroscience at the University of Alberta. Recently he was appointed to a Canadian Research Chair in Movement Physiology. His research program is focused on the nervous control of walking and functional recovery after injury of the nervous system. Dr. Pearson has served as a member of editorial boards of a number of leading scientific journals, such as the *Journal of Neurophysiology* and the *Journal of Neuroscience*. He is chair of the Scientific Advisory Committee of the Neuroscience Canada Foundation and one of the two Neuroscience grant review committees of the Canadian Institutes of Health Research. – Address: Department of Physiology, Faculty of Medicine and Dentistry, University of Alberta, 7-55 Medical Sciences Building, Edmonton, Alberta T6G 2H7, Canada.

Coming to the Wissenschaftskolleg zu Berlin

My primary motivation for coming to Berlin was to collaborate with a multidisciplinary group of scientists to develop computational models of walking. My anticipated contribution to this project was to provide information of the neuronal control of walking in mammals. In addition, I hoped to have the opportunity to write up some recent experimental

findings, revise some chapters in a general textbook on Neuroscience, learn more about the mathematics for describing biomechanical systems, and to visit a number of laboratories in Europe and Scandinavia. My tenure at the Wissenschaftkolleg was the 6-month period from February 1 to July 31, 2002.

Progress during my tenure at the Wissenschaftskolleg

Overall I would rate my time at the Wissenschaftskolleg as very productive. Most importantly, my colleagues and I have made substantial progress in developing what we call "neuro-mechanical simulations" of walking in mammals and insects (specifically the cat and the stick insect). The objective of this project was to combine contemporary knowledge about the functioning of neuronal networks in the walking systems of mammals and insects with mechanical models of muscles and skeletons to get realistic computer simulations of walking. The value of this work is twofold. First it highlights shortcomings in our knowledge about neural, muscular, mechanical, and behavioral aspects of walking, and second it allows us to test hypotheses about neural control mechanisms. A deeper understanding of the neural control of walking systems will undoubtedly be useful to neuroscientists developing strategies for facilitating functional recovery of walking after spinal cord injuries and to engineers attempting to construct robotic walking machines.

By developing the computer simulations, my colleagues and I have gained a greater appreciation for the complexity of the walking systems, as well as insights into some of the problems that must be solved before we can be confident we know how walking is controlled by the nervous system. Importantly, a list of experiments has emerged from our discussions which, when done, will provide data to develop our models more fully. Our project has the potential to become one of the leading programs in the world in which the expertise of computer scientists, theoreticians, and neuroscientists is combined to understand the neural control and biomechanics of animal movement. Thus, after returning to Canada, I plan to continue our collaboration and to commit substantial resources to enhance the research program.

Although the collaborative project on locomotion was the main focus of my work at the Wissenschaftskolleg, I was pleased to have sufficient time to complete a number of writing projects. In collaboration with colleagues in Canada, the USA, and England, I completed the drafts of three articles on our recent experimental work (two of which have been accepted for publication and the third will be submitted in the near future) and two new

chapters for another edition of a major textbook on Neuroscience (*Principles of Neural Science*, edited by E. R. Kandel, J. H. Schwartz, and T. M. Jessell). I have also revised two other chapters I had written previously for the same textbook. I also found time to give research seminars at four universities in Germany (Freiburg, Ulm, Hanover, and Cologne), participate in an international meeting on motor control at the University of Bielefeld, visit Rome twice to give research talks, and present our recent experimental findings to a research group at the Karolinka Institute in Stockholm. So the past six months have been very active and highly stimulating.

<div align="center">Reflections on the Wissenschaftskolleg</div>

I am sure that all Fellows would agree that the Wissenschaftskolleg is a wonderful environment for scholarly work. Not only is there ample opportunity to pursue one's interests free of the impediments of normal academic life, but the interaction with Fellows with vastly different interests provides a motivation for thinking more broadly. The Wissenschaftkolleg is clearly a perfect institution for anyone with a need for time to work on a specific project or to develop the background for new projects.

As an experimental scientist, however, I have encountered two difficulties that have dampened my enthusiasm somewhat. The first was to maintain the momentum of an active research program in Canada. Only so much can be done via e-mail, and I found it impossible to provide close and timely supervision to students and support staff. Fortunately, I was able to return briefly to Canada twice during my 6-month tenure, thus enabling me to consult with my colleagues and deal with organizational problems in the laboratory. Of course I recognize that the difficulty of running a laboratory from a distance has nothing to do with the structure of the Wissenschaftskolleg, but it does raise an important issue related to the needs of experimental scientists at the Wissenschaftskolleg, namely how to maintain close links with the laboratory. Perhaps brief return visits should be encouraged and paid for by the Wissenschaftskolleg, and this possibility should be made explicit at the time of negotiating contracts.

The second difficulty was the inability to immediately access information from a library. In Canada, I have become used to accessing most journals through on-line subscriptions via the Web and visiting a large library near my office to check simple facts in books and journals not on-line. The necessity of have to wait a day or more for a simple piece of information that normally might have been obtained almost instantaneously was sometimes

frustrating. This comment is in no way meant to be a criticism of the library service, which is truly excellent for its current structure. One potential solution would be for the Wissenschaftskolleg to establish a system for gaining on-line access to major journals. Obviously the small number of Fellows in any one field each year does not warrant the Wissenschaftskolleg purchasing these subscriptions on its own, but there may be a way to do this in collaboration with a major university in Berlin. An added advantage of having on-line subscriptions is that high-resolution images of diagrams (often in color) can be downloaded for incorporation into talks.

Apart from these (relatively minor) concerns, life at the Wissenschaftskolleg was extremely comfortable and highly stimulating. Perhaps my fondest memory will be the lively discussions emerging from the Tuesday morning colloquia. It was wonderful to learn about the academic interests of Fellows in the Arts and Humanities and to realize the enormous diversity in ways of thinking and methods for gaining knowledge. It was a privilege being part of this dynamic community. I am grateful to the Wissenschaftskolleg for giving me the opportunity.